

DC-Micromotors

Precious Metal Commutation

3,2 mNm

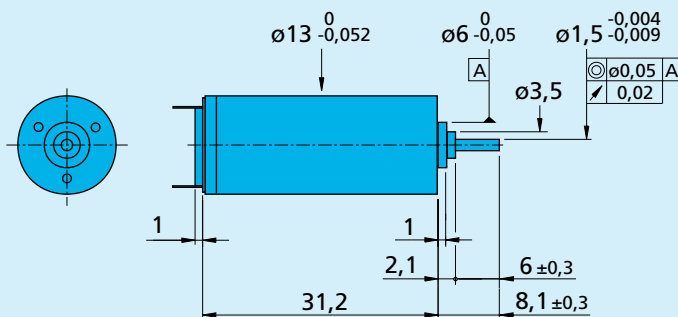
For combination with (overview on page 14-15)

Gearheads:
13A, 14/1, 15/3, 15/5

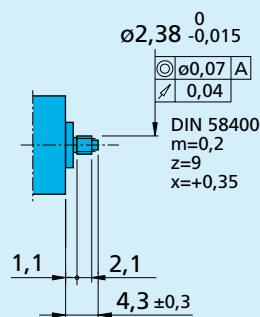
Encoders:
IE2 – 50 ... 400

Series 1331 ... SR

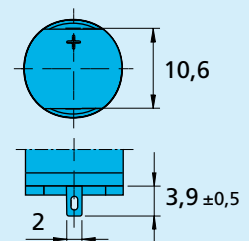
		1331 T	006 SR	012 SR	024 SR	
1	Nominal voltage	U_N	6	12	24	Volt
2	Terminal resistance	R	2,83	13,7	52,9	Ω
3	Output power	$P_{2 \max.}$	3,11	2,57	2,66	W
4	Efficiency	$\eta_{\max.}$	81	80	80	%
5	No-load speed	n_o	10 600	9 900	10 400	rpm
6	No-load current (with shaft \varnothing 1,5 mm)	I_o	0,0220	0,0105	0,0055	A
7	Stall torque	M_H	11,20	9,90	9,76	mNm
8	Friction torque	M_R	0,12	0,12	0,12	mNm
9	Speed constant	k_n	1 790	835	439	rpm/V
10	Back-EMF constant	k_E	0,56	1,20	2,28	mV/rpm
11	Torque constant	k_M	5,35	11,4	21,8	mNm/A
12	Current constant	k_I	0,187	0,087	0,046	A/mNm
13	Slope of n-M curve	$\Delta n/\Delta M$	946	1 000	1 070	rpm/mNm
14	Rotor inductance	L	70	310	1 100	μH
15	Mechanical time constant	τ_m	7	7	7	ms
16	Rotor inertia	J	0,71	0,67	0,63	gcm ²
17	Angular acceleration	$\alpha_{\max.}$	160	150	160	$\cdot 10^3 \text{rad/s}^2$
18	Thermal resistance	$R_{th 1} / R_{th 2}$	6 / 25			K/W
19	Thermal time constant	τ_{w1} / τ_{w2}	5 / 190			s
20	Operating temperature range:					
	– motor		– 30 ... + 85 (optional – 55 ... + 125)			°C
	– rotor, max. permissible		+ 125			°C
21	Shaft bearings		sintered bronze sleeves			
22	Shaft load max.:					
	– with shaft diameter		1,5			mm
	– radial at 3 000 rpm (3 mm from bearing)		1,2			N
	– axial at 3 000 rpm		0,2			N
	– axial at standstill		20			N
23	Shaft play:					
	– radial	\leq	0,03			mm
	– axial	\leq	0,2			mm
24	Housing material		steel, black coated			
25	Weight		19			g
26	Direction of rotation		clockwise, viewed from the front face			
Recommended values - mathematically independent of each other						
27	Speed up to	$n_{e \max.}$	12 000	12 000	12 000	rpm
28	Torque up to	$M_{e \max.}$	3,2	3,2	3,2	mNm
29	Current up to (thermal limits)	$I_{e \max.}$	0,81	0,37	0,19	A



1331 T ... SR



1331 E ... SR
for Gearheads 15/...



Planetary Gearheads

0,3 Nm

For combination with (overview on page 14-15)
DC-Micromotors:
1319, 1331, 1336

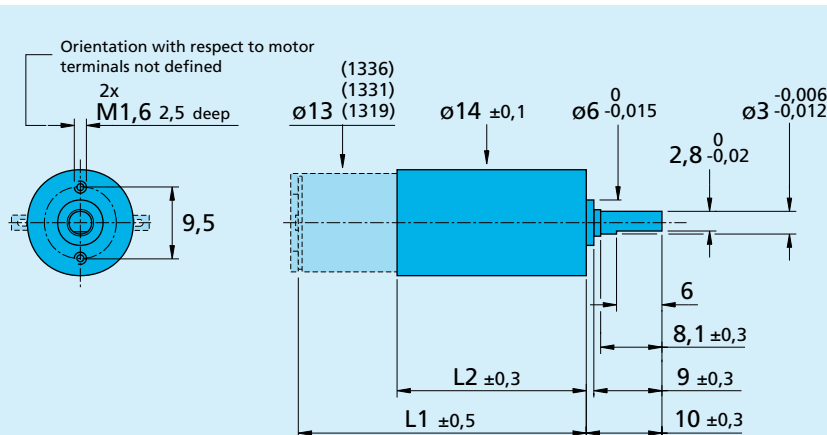
Series 14/1

	14/1
Housing material	metal
Geartrain material	all steel
Recommended max. input speed for:	
– continuous operation	5 000 rpm
Backlash, at no-load	≤ 1°
Bearings on output shaft	preloaded ball bearings
Shaft load, max.:	
– radial (6,5 mm from mounting face)	≤ 20 N
– axial	≤ 5 N
Shaft press fit force, max.	≤ 5 N
Shaft play (on bearing output):	
– radial	≤ 0,02 mm
– axial	= 0 mm
Operating temperature range	– 30 ... + 100 °C

Specifications

reduction ratio (nominal)	weight without motor g	length without motor L2 mm	length with motor			output torque		direction of rotation (reversible)	efficiency %
			1319 T L1 mm	1331 T L1 mm	1336 U L1 mm	continuous operation M max. mNm	intermittent operation M max. mNm		
3,71 :1	17	20,9	34,1	45,9	50,9	200	300	=	90
14 :1	20	25,0	38,2	50,0	55,0	300	450	=	80
43 :1	24	29,2	42,4	54,2	59,2	300	450	=	70
66 :1	24	29,2	42,4	54,2	59,2	300	450	=	70
134 :1	27	33,3	46,5	58,3	63,3	300	450	=	60
159 :1	27	33,3	46,5	58,3	63,3	300	450	=	60
246 :1	27	33,3	46,5	58,3	63,3	300	450	=	60
415 :1	30	37,4	50,6	62,4	67,4	300	450	=	55
592 :1	30	37,4	50,6	62,4	67,4	300	450	=	55
989 :1	30	37,4	50,6	62,4	67,4	300	450	=	55
1 526 :1	30	37,4	50,6	62,4	67,4	300	450	=	55
2 608 :1	34	41,5	54,7	66,5	71,5	300	450	=	50
4 365 :1	34	41,5	54,7	66,5	71,5	300	450	=	50
5 647 :1	34	41,5	54,7	66,5	71,5	300	450	=	50

Note: The reduction ratios are rounded, the exact values are available on request.



Encoders

Magnetic Encoders

Features:
 50 to 400 Lines per revolution
 2 Channels
 Digital output

Series IE2 – 400

		IE2 – 50	IE2 – 100	IE2 – 200	IE2 – 400	
Lines per revolution	N	50	100	200	400	
Signal output, square wave		2				channels
Supply voltage	V _{DD}	4,5 ... 5,5				V DC
Current consumption, typical (V _{DD} = 5 V DC)	I _{DD}	typ. 6, max. 12				mA
Output current, max. ¹⁾	I _{OUT}	5				mA
Pulse width	P	180 ± 45				°e
Phase shift, channel A to B	Φ	90 ± 45				°e
Signal rise/fall time, max. (C _{LOAD} = 50 pF)	tr/tf	0,1 / 0,1				µs
Frequency range ²⁾ , up to	f	20	40	80	160	kHz
Inertia of code disc	J	0,05				gcm ²
Operating temperature range		– 25 ... + 85				°C

¹⁾ V_{DD} = 5 V DC: Low logic level < 0,5 V, high logic level > 4,5 V: CMOS and TTL compatible

²⁾ Velocity (rpm) = f (Hz) x 60/N

Ordering information

Encoder	number of channels	lines per revolution	in combination with:
IE2 – 50	2	50	DC-Micromotors series 1319 ... SR, 1331 ... SR
IE2 – 100	2	100	
IE2 – 200	2	200	
IE2 – 400	2	400	

Features

These incremental shaft encoders in combination with the FAULHABER DC-Micromotors are used for indication and control of both, shaft velocity and direction of rotation as well as for positioning.

The encoder is integrated in the DC-Micromotors SR-Series and extends the overall length by only 1,7 mm!

Hybrid circuits with sensors and a low inertia magnetic disc provide two channels with 90° phase shift.

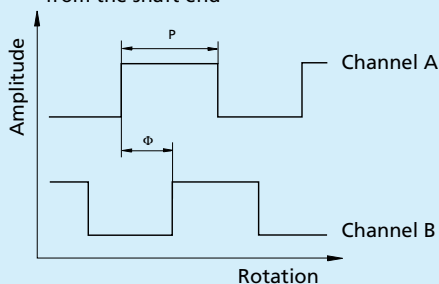
The supply voltage for the encoder and the DC-Micromotor as well as the two channel output signals are interfaced through a ribbon cable with connector.

Details for the DC-Micromotors and suitable reduction gearheads are on separate catalogue pages.

Output signals / Circuit diagram / Connector information

Output signals

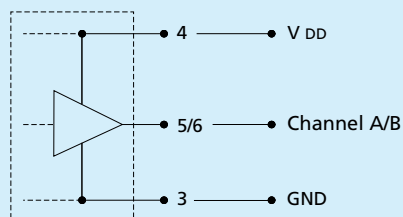
with clockwise rotation as seen from the shaft end



Admissible deviation of phase shift:

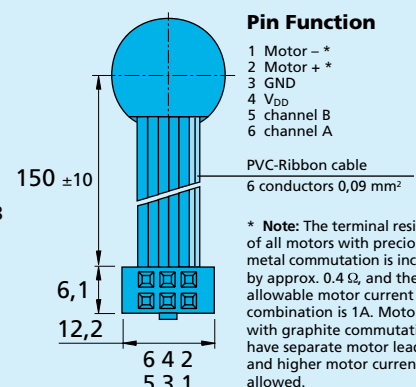
$$\Delta\Phi = \left| 90^\circ - \frac{\Phi}{P} * 180^\circ \right| \leq 45^\circ$$

Output circuit



Pin Function

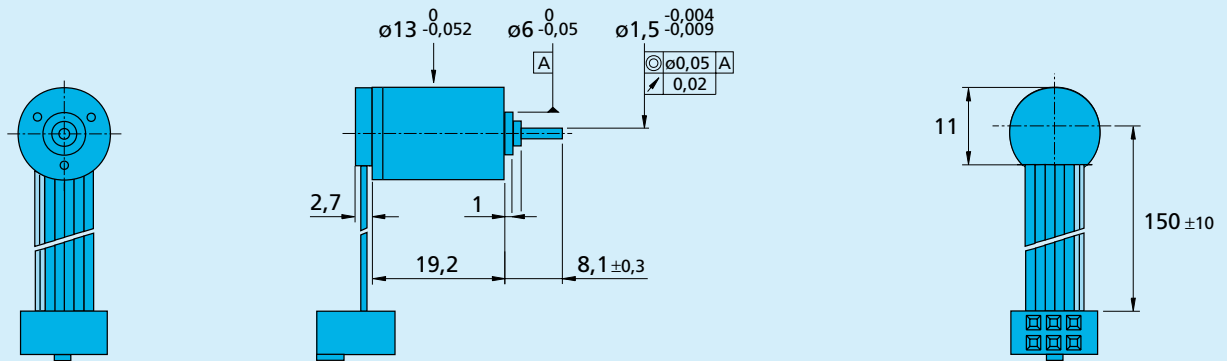
- 1 Motor – *
- 2 Motor + *
- 3 GND
- 4 V_{DD}
- 5 channel B
- 6 channel A



* Note: The terminal resistance of all motors with precious metal commutation is increased by approx. 0,4 Ω, and the max. allowable motor current in combination is 1A. Motors with graphite commutation have separate motor leads and higher motor current is allowed.

Connector
 DIN-41651
 grid 2,54 mm

DC-Micromotor 1319 T ... SR with Encoder IE2 – 50 ... 400



DC-Micromotor 1331 T ... SR with encoder IE2 – 50 ... 400

